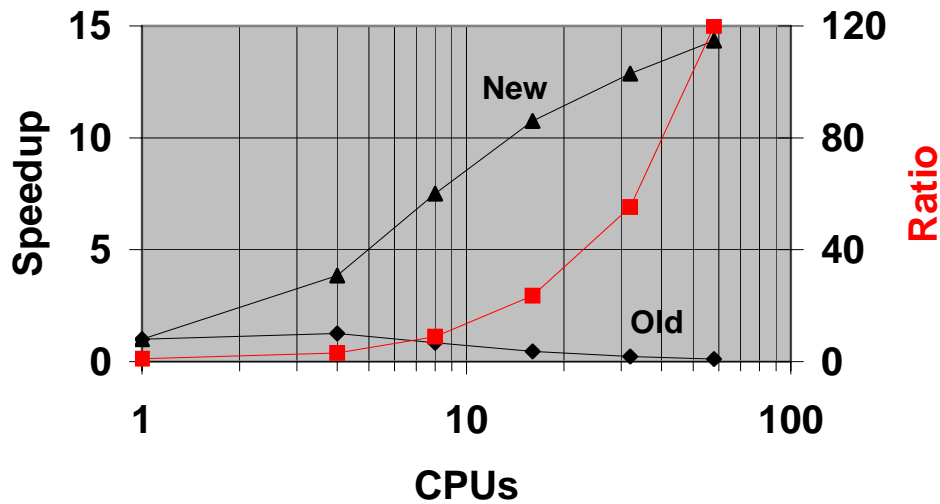**MPI Speedup of Criticality Calculations**

This graph gives speedup results for a criticality problem on a LANL Beowulf cluster of 2 GHz processors interconnected by fast Ethernet. Speedup was determined by the wall-clock time of a sequential calculation divided by the wall-clock time of a parallel calculation. The "old" curve was run with MCNPX 2.5.D and demonstrates the poor parallel performance of criticality problems in previous versions of MCNP(X). The "new" curve was run with MCNPX 2.5.E and shows the significant increase in parallel performance for the new communication algorithm. The "Ratio" curve indicates that this new algorithm increases speedup by a factor of nearly 10 for 8 CPUs and by more than a factor of 100 for 58 CPUs. The criticality problem used in this timing study is called Godiva and the input file is given below. Note that each run used 500,000 particles/cycle for 200 total cycles. The sequential run with 2.5.E took 6140s.

```
godiva
1   1 -18.74  -1
2   0        1

1    so 8.741

kcode 500000 1.0 10 200
ksrc  0. 0. 0.
imp:n 1 0
m1    92235 -94.73  92238 -5.27
prdmp j 500
```